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EXAMINER	
STEVENS, THOMAS H	
ART UNIT	**PAPER NUMBER**
2123	

DATE MAILED: 06/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	09/838,801	BERK ET AL.	
	Examiner	Art Unit	
	Thomas H. Stevens	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 April 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17,19-31 and 33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17,19-31 and 33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-33 were initially examined.

2. Claims 18 and 32 are cancelled.

3. Claims 1-17, 19-31, 33 were examined.

Section I: Response to Applicants' Arguments (1st office action)

Oath

4. Applicants are thanked for addressing in this issue. The MPEP chapter 602, section IV states the title of invention should be provided but is not necessary. Objection is withdrawn.

Specification/Drawings /Claim Objections

5. Applicants are thanked for addressing in this issue. Objections are withdrawn.

35 U.S.C. § 101

6. Applicants are thanked for addressing in this issue. However, the amended claims are still non-statutory because they not only recited a mathematical calculation but there's no post-solution activity. For example, claim 1 limitations are processing all these steps (i.e., calculating and determining) but the claims doesn't state the purpose, application or benefit. Summarily, the claims in this specific case have to merit some end result (e.g., for improvement mechanical efficiency). Rejection stands.

35 U.S.C. § 102/103

7. Applicants are thanked for addressing in this issue. However, examiner finds applicants' arguments non-persuasive since the applicant has admitted, "that the same

spectral region may be covered" (applicants response: pg 13, 3rd paragraph), thus stating the prior art suggest this limitation. Rejection stands.

Section I: Final Rejection (2nd Office Action)

Non-Statutory Material 35 USC § 101

8. MPEP 2106, section 4.

> Claims to processes that do nothing more than solve mathematical problems or manipulate abstract ideas or concepts are more complex to analyze and are addressed below. If the "acts" of a claimed process manipulate only numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. Schrader, 22 F.3d at 294-95, 30 USPQ2d at 1458-59. **Thus, a process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter and thus cannot constitute a statutory process.**

9. Claims 1-17, 19-31, 33 are rejected under 35 U.S.C. 101 because the claimed invention is directed to a mathematical algorithm. The examiner respectfully submits that the applicants have not claimed a practical application. An invention which is eligible for patenting under 35 U.S.C. § 101 is in the "useful arts" when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The fundamental test for patent eligibility is thus to determine whether the claimed invention produces a "useful, concrete and tangible result."

The examiner respectfully submits, under current PTO practice, that the claimed invention does not recite a tangible or concrete result. The claims are not tangible because they appear to recite a mathematical algorithm namely the band model method for modeling atmospheric propagation at arbitrarily fine spectral resolution used to model and analyze individual atomic and molecular species by providing the spectral

transmittances for at least the calculation of entrances aperture radiances, in a confined or limited space that doesn't have specific preprocessing or post solution activity.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. **Claims 1 and 2** are rejected under 35 U.S.C. 102(b) as being anticipated by Abreu et al (U.S. Patent Number 5,315,513), herein referred to as. **Abreu**.

12. As to **Claim 1**, **Abreu** teaches: a band model method for computing individual atomic transmittances through a gaseous medium **(column 2, line 67-column 3, line 4)**. **Abreu** teaches dividing the spectral region being considered into a number of spectral bins, each having a width of less than 1.0 cm^{-1} **(column 4, lines 54-55)** wherein the bins are 1 cm^{-1} in width, but since they cover the region from 0 to 50,000 cm^{-1}, or 0.2um to infinity, it is noted that the bins of 1 cm^{-1} cover the same spectral region of interest as would for bins having a width of less than 1.0 cm^{-1}. **Abreu** teaches calculating the equivalent width of atomic and molecular transitions centered within each spectral bin **(column 15, lines 3-21)**. Further, **Abreu** teaches calculating line tail absorption within each spectral bin from atomic and molecular transitions not centered within the bin **(column 13, lines 1-5).**

13. As to **Claim 2**, **Abreu** teaches the spectral bins have a width of about 0.1 cm^{-1} **(column 4, lines 54-55)** wherein the bins are 1.0 cm^{-1} in width, but since they cover the region from 0 to 50,000 cm^{-1}, or 0.2um to infinity, it is noted that the bins of 1 cm^{-1} cover the same spectral region of interest as would for bins having a width of about than 0.1 cm^{-1}.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

15. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

16. **Claims 3,4,17-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Abreu** as applied to **Claim 1** above, and further in view of Piters et al (Piters et al, "A Combined Fourier-Bessel Transformation Method to Derive Accurate Rotational Velocities", Astronomy and Astrophysics Supplement Series 118, 1996, pages 529-544), herein referred to as **Piters**.

17. As to **Claims 3,4,17 and 20**, **Abreu** teaches dividing the spectral region being considered into a number of spectral bins **(column 4, lines 54-55)** and calculating the equivalent width of atomic and molecular transitions using an approximation to Voigt's line shape **(column 14, lines 63-66)**.

18. **Abreu** does not expressly teach using an exact expansion to Voigt's function wherein the exact expansion is an exact modified Bessel functions expansion.

19. **Piters** teaches an exact expansion Voigt's function wherein the exact expansion is an exact modified Bessel functions expansion **(page 530, equations 5-8 and description)**.

20. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify calculation of the equivalent widths of atomic and molecular transitions using an approximation to Voigt's function as taught in **Abreu** by using an exact expansion Voigt's function wherein the exact expansion is an exact modified Bessel functions expansion as taught by **Piters (page 530, equations 5-8 and**

description) since **Piters** and **Abreu** are both directed to spectral analysis in atmospheric conditions and **Piters** is directed to known spectral analysis techniques.

21. As to **Claims 5 and 21**, **Abreu** teaches the calculating step includes subtracting line-tail absorption as calculated from the column strength, the Lorentz half-width, the Doppler half-width, and the line tail spectral displacement **(column 15, equation 22 and 24)**.

22. As to **Claims 6 and 22**, **Abreu** teaches the calculating step includes determining the Voigt line-shape function computed at specific frequencies **(column 7, lines 7-9)**.

23. As to **Claim 19**, **Abreu** teaches the spectral bins have a width of about 0.1 cm^{-1} **(column 4, lines 54-55)** wherein the bins are 1.0 cm^{-1} in width, but since they cover the region from 0 to 50,000 cm^{-1}, or 0.2um to infinity, it is noted that the bins of 1 cm^{-1} cover the same spectral region of interest as would for bins having a width of about than 0.1 cm^{-1}.

24. **Claims 7, 23, 24,30-33** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Abreu** as applied to **Claim 1** above, and further in view of Martin et al (Martin et al, "Generalized Lorentzian Approximations for the Voigt Line Shape" Applied Optics, Vol. 20, No.2, January, 1981, pages 259-263), herein referred to as **Martin**.

25. As to **Claims 7 and 23**, **Abreu** teaches dividing the spectral region being considered into a number of spectral bins **(column 4, lines 54-55)** calculating line tail

absorption within each spectral bin from atomic and molecular transitions not centered within the bin **(column 13, lines 1-5).**

26. **Abreu** does not expressly teach calculating line tail absorption within each bin from atomic and molecular transitions centered outside of the bin using Pade approximant spectral fits to Voigt absorption coefficient curves.

27. **Martin** teaches using Pade approximant spectral fits to Voigt absorption coefficient curves since the Pade method obtains simple and adequate approximations to a given function, useful to the spectroscopist since the Pade method does not introduce new artificial parameters as would be introduced if approximating the Voigt function by a sum of Lorentzian and Gaussian functions **(page 259, column 2)**.

28. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the calculation of line tail absorption as taught in **Abreu** to use a Pade approximant spectral fits to the Voigt absorption coefficient curves as taught by **Martin** since the Pade method obtains simple and adequate approximations to a given function, useful to the spectroscopist since the Pade method does not introduce new artificial parameters as do by approximating the Voigt function by a sum of Lorentzian and Gaussian functions **(page 259, column 2)**.

29. As to **Claims 8,14,15, 24,30 and 31**, **Abreu** teaches: the line tail absorption calculation step includes determining a database of temperature and pressure dependent band model parameters combined with integration over Voigt's line shape **(column 6, lines 6-8, column 7, lines 26-28, column 10, lines 58-60)**. Since the Voigt curves are determined using a model based on temperature and pressure dependent

model parameters, it is concluded that if Pade approximates are used to determine approximant spectral fits to the Voigt absorption coefficient curve, the approximates would be temperature and pressure dependent. Further, the temperature and pressure dependent parameters are saved to a database **(column** 13, lines 55-57).

30. As to **Claim 28**, **Martin** teaches one Pade parameter is the derivative of the absorption coefficient with respect to the normalized spectral variable at the line center **(page 259, Introduction),** where "b" is the normalization parameter.

31. As to **Claim 29**, **Martin** teaches one Pade parameter is the integral of the spectral absorption coefficient over the spectral band **(page 259, Introduction, page 260, equation 10)** wherein a Pade parameter is the approximation to Voigt's integral.

32. As to **Claim 33**, **Abreu** teaches the spectral bins have a width of about 0.1 cm^{-1} **(column 4, lines 54-55)** wherein the bins are 1.0 cm^{-1} in width, but since they cover the region from 0 to 50,000 cm^{-1}, or 0.2um to infinity, it is noted that the bins of 1 cm^{-1} cover the same spectral region of interest as would for bins having a width of about than 0.1 cm^{-1}.

33. **Claims 9,10,25-27** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Abreu and Martin**, as applied to **Claims 7 and 23** above, and further in view of Weisstein (Weisstein, Eric, CRC Concise Encyclopedia of Mathematics, Chapman & Hall/CRC, 1999, pages 1297-1298), herein referred to as **Weisstein**.

34. As to **Claims 9,10**, **25 and 26**, **Abreu and Martin** teach using Pade approximant spectral fits to Voigt absorption coefficient curves **(Martin: page 259, column 2)** and

teaches the power series to be approximated by the Pade method **(Martin: page 260, equation 10)** where n is the number of poles.

35. **Abreu and Martin** do not expressly teach there are five Pade parameters wherein the Pade parameters are determined from summed line tail spectral absorption coefficients.

36. **Weisstein** teaches the Pade approximants to a power series wherein an n number of Pade coefficients and approximates are found **(page 1297, column 2 and page 1298)**.

37. It would have been obvious to one of ordinary skill in the art at the time the invention was made that the Pade approximation includes an expansion of a power series that can include the calculation of any given number of coefficients and approximates for a given number of poles. Therefore, it is the Pade method could yield five parameters. Further, it is concluded that if this method is used to expand and approximate Voigt's function which is used to calculate line tail spectral absorption, as taught by **Abreu and Martin**, than the Pade parameters would be determined from summed line tail spectral absorption coefficients as taught by **Weisstein (page 1298, equations 7-12 and column 2, Pade Approximates)**.

38. As to **Claims 11 and 27**, **Abreu and Martin** teach one Pade parameter is determined at the center of the bin, and one at each edge of the bin **(Martin: page 259, Introduction and Abreu: column 6, lines 21-22),** wherein Voigt's line shape is integrated over a bin, encompassing the center of the bin and the edges of the bin.

39. As to **Claim 12**, **Abreu and Martin** teach wherein one Pade parameter is the derivative of the absorption coefficient with respect to the normalized spectral variable at the line center **(Martin: page 259, Introduction),** where "b" is the normalization parameter.

40. As to **Claim 13**, **Abreu and Martin** teach the Pade parameter is the integral of the spectral absorption coefficient over the spectral band **(Martin: page 259, Introduction, page 260, equation 10)** wherein a Pade parameter is the approximation to Voigt's integral.

41. **Claim 16** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Abreu** as applied to **Claim 1** above, and further in view of Applicant's Own Admission, herein referred to as **AOA**.

42. As to **Claim 16**, **Abreu** teaches the equivalent width is calculated from atomic and molecular transitions located outside the bin **(column 15, equation 22)** wherein W_{sl}^{1} indicated the tail contribution, and the tail line absorptions are calculated from atomic and molecular transitions not centered within a half spectral bin width from the bin **(column 13, lines 1-5).**

43. **Abreu** does not expressly teach the atomic and molecular transitions are centered no more than half a spectral bin width from the bin.

44. **AOA** teaches the equivalent widths are calculated from atomic and molecular transitions centered no more than half a spectral bin width from the bin since offsetting

the location of the effective line from the center of the bin gives a more representative result for the average absorption of the two line tails **(page 5, lines 20-23)**.

45. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the calculation of equivalent widths from atomic and molecular transitions located outside the bin as taught in **Abreu** with calculating the equivalent widths from atomic and molecular transitions centered no more than half a spectral bin width from the bin since offsetting the location of the effective line from the center of the bin gives a more representative result for the average absorption of the two line tails **(page 5, lines 20-23)** as taught in **AOA**.

Conclusion

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Tom Stevens whose telephone number is 571-272-3715, Monday-Friday (8:00 am- 4:30 pm) or contact Supervisor Mr. Leo Picard at (571) 272-3749. Fax number is 571-273-3715.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100.

June 21, 2005

THS